ENVIRONMENTAL Fact Sheet

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

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WD-WSEB-1-6 1999

Point Well Design

(Go directly to sketch of Point Well Design)

Three sections of the Department of Environmental Services (DES) provide assistance to citizens with private well problems. These sections are the DES Laboratory Services Unit, the Water Supply Engineering Bureau and the New Hampshire Water Well Board. Their addresses and telephone numbers appear at the end of this document.

For the most part, this document assumes you are evaluating the installation of a new point well type water supply source for domestic home use. These wells are called "washed wells." In many cases there is relatively little choice in well type since this decision is so controlled by the type of soil and the height of the water table on your property. Suggestions concerning inspection of existing point wells can be found on page 5-6. For information concerning well abandonment see the DES fact sheet **WD-WSEB-1-7**.

GOVERNMENT REGULATIONS

State Regulations: A person or firm in the business of point well construction must be licensed by the NH Water Well Board. The Board requires the submission of a "well completion report" describing the well's dimensions, construction, yield and static water level.

There are **statewide** design criteria rules pertaining to point well **construction** and **placement**. These rules were originally adopted by the Board in 1983 and revised in 1997. The rules are numbered We 100-900. There are no state requirements concerning minimum water**quality** or**quantity** for private home wells.

Finally, **RSA 477:4-c** requires, when selling a home with an on-site water system, disclosure of the water system's location, malfunctions, date of installation, date of the most recent water test and whether or not the seller has experienced a problem such as an unsatisfactory water test.

Local Regulations: Some towns may have local permit requirements relative to the placement, construction, water quantity or quality for private point wells. Please contact your local health officer or code enforcement officer for particulars.

EVALUATING A NEW WATER SYSTEM

There are several items to consider when building a water system. These are described below:
Determining How Much Water You Use

A typical household requires approximately 5 gallons per minute (gpm) to meet modest domestic water needs. Factors to be considered when determining your family's minimum demand on your water system include: the number of water uses that you have, their flow rates, how many of these uses could occur simultaneously and for what duration.

Determining How Much Well Yield You Need

What minimum well yield will satisfy your family's water needs is more difficult to identify. As little as 2-3 gpm could be tolerated if there is adequate water system storage. A low yield well (for example 1 gallon per minute) may be acceptable if there is meaningful storage however, this is clearly marginal situation with little factor of safety. There is no meaningful water "stored" within the point well casing however, meaningful storage could be achieved by the use of a large storage tank(s) in your basement or other location.

DES has published a document entitled "Well Yield, How Much Water is Enough?" which is available for $2.00 through the Water Well Board. The United States Department of Agriculture, Farmers Home Administration Guidelines require a minimum well yield of 1200 gallons for a four-hour period (an average pumping rate of 5 gallons per minute).

Large non-pressurized storage tanks can serve to accumulate water during periods of non-use, however, an additional pump will be necessary to pressurize this water. This option has additional expense and uses valuable floor space. It is clearly a response to a well that lacks normal capacity.

Seasonal Changes In Well Yield The yield of a point well can be effected by drought and can also change with time due to clogging of the well screen and development in the upstream watershed. To reduce the risk of low water table effects the well point should be installed significantly below the anticipated seasonal low water table. It is not uncommon to have a 5-10 foot variation between the spring and fall groundwater levels. In order to maintain suction, the entire well screen must always be below the water table. If the water table drops below the well screen, the water pump will "loose it prime" and will no longer be able to raise the water out of the well. The seasonal **high** water table can be determined by soil experts based on the color profile of the soil. It is generally not possible to determine the seasonal **low** water table.

In addition to loosing prime, pumps for points wells are limited relative to lifting water or "suction lift". See page 4 for a further discussion relative to the limitation inherent in pumping water by "suction lift."

Water Quality Considerations

Point wells experience iron, manganese, and taste and odor conditions approximately as often as bedrock wells. Point wells generally do not experience the arsenic, fluoride and radiological problems that are often seen in bedrock wells. Point wells are normally resistance to bacterial problems due to the high quality of their construction materials.

Well Placement and Protection

Since point wells take their recharge water from the highest water table, they are typically sensitive to water quality impacts from those land use activities that take place in the immediate vicinity of the well.

Examples of pollution hazards to your well include the application or inadvertent spillage of fertilizer, pesticides, and inappropriate disposal of old crankcase oil, anti-freeze or solvents, or

waste salt brine from water softeners. Thus the use of chemicals in your backyard or that of your uphill neighbors may negatively affect the quality of the groundwater recharging your point well.

Tests for many of these chemicals involve complex and costly laboratory procedures. Thus the best and least costly approach to protect the drinking water quality of your point well is prevention of pollution rather than treatment after the fact. Be careful with respect to the use and disposal of chemicals near and upstream of your well or the wells of others.

The following protective distances are required or recommended when locating a point well for a private single family home:

a) Surface water and drainage culverts should not pass within 25 feet of a point well; 50'+ is recommended.
b) Animals should not be penned or tied within a minimum of 20 feet of a point well;75'+ is recommended.
c) Leach fields and septic tanks shall not be located within 75 feet of a point well.
d) Point Wells should not be located within 50 feet of the right-of-way line of roads, preferably more.
e) Point Wells shall not be placed within 75 feet of adjacent property which you do not control. (See RSA 485-A:30-b). If placement is made necessary within 75 feet, a "standard release form" is required to be signed by the well owner and given to DES, the town health officer and the registry of deeds. Since most zoning codes require a 10 foot setback from adjoining property, this distance is effectively 65 feet.
See fact sheet WD.-WSEB-21-4.
f) A point well should not be placed in locations subject to ANY flooding unless the immediate (25 feet radius) vicinity of the well is built up above the highest flood level.

Choosing The Well Type You Will Purchase

Based on the considerations above, such as soil depth, water quantity needs, and existing pollution, a well type can now be chosen. In many cases, there is little choice since the choice of well types is largely influenced by the type of soil and the water availability on the property. As previously stated, this fact sheet pertains to point wells.

CONSTRUCTION OF A NEW POINT WELL

Point wells are typically pounded or "jetted" into the ground. Typically point wells are used where soil is fine to medium sand and the water table is high and relatively stable year round. The presence of larger stones will typically prevent the installation of a point well casing into the soil.

Contracting With a Point Well Contractor

Prior to actual installation, you will need to provide the contractor with guidance as to what concept will govern the amount of work to be done. Normally, point wells are installed in accordance with a lump sum agreement. However, this method does not insure the deepest well unless that issue is specified as part of the agreement. The nature of all well contracts is between the homeowner and the well contractor.

Excavation and Backfill

In general there is no excavation, per se, for point wells. The well screen is either hammered into the ground or a very small diameter hole is jetted into the soil by the high speed flow of water. The point well should be installed as deep as reasonably possible to prevent drought impact. However, the suction capability of the centrifugal pump also must be considered. Back fill

around the top of the well point with very fine soils. Mound this material up around the location of the well point.

Apron

To insure adequate filtration of the water entering the point well, an impervious apron of clay or fine silt should be placed entirely around the immediate well area. This apron should be approximately 3-5 feet wide. Finally, the apron should be loamed and seeded to assure a stable condition.

Configuration of The Upper Portion of the Well Point

As seen in the **sketch**, the top of the well has a "T" configuration. We recommend this configuration. It provides the ability to add chlorine to the well if needed and gives a clear visual indication of the well's location. The entire assembly must be airtight in order for the water pump to maintain a vacuum within the well. Air entering a point well will cause a loss of vacuum and the inability to pump. A locking cap or other vandal proofing is recommended.

Water Supply Line

Provide a minimum of 5 feet of cover over the water line to the home for frost protection. Before backfill, take field measurements of the precise location of the well and the entire discharge line and then draw a accurate sketch. Duplicate this sketch, laminate with plastic and attach one copy to your pressure tank another to your fuse box. Seal the electrical conduit to reduce radon entry into the basement.

PUMPING FROM A POINT WELL

The typical pump for a point well is a centrifugal pump located in the basement of your home or in a protective, often heated, enclosure at the top of the well. To pump water from a point well, the pump creates a vacuum within the well point. This vacuum pulls the water into the well and up and into the pump impellers. This configuration is subject to at least two operational limitations discussed below.

First no matter how perfect the pump's vacuum, water can not be raised **by suction** more than approximately 32 feet at sea level. As a practical reality, conventional centrifugal pumps can only raise water by suction, 20-25 feet. Where the water table is deeper than 25 feet below the centerline of the pump, conventional pumping equipment will not work. A "deep well" packer jet pump mechanism can be installed, however, a larger vertical casing/well screen is required which is more expensive.

The second condition occurs if the vacuum is lost by air entering the wellpoint through leakage at the piping joints or because the water level is below the screen of the well point.

ACTIONS AFTER CONSTRUCTION

Determining the Well's Safe Yield

You should know the well's safe yield. Once the point well has been installed, a pump test can be performed. The safe yield of a newly completed point well can be determined (and the well can be flushed) by pumping water continuously over a sustained period of 24 or more hours. The pumping rate should be measured by noting the number of minutes required to fill a known volume container, such as a 20 or 32 gal. trash can. The water level within the point well casing can not be measured. However, if there is no air in the pumped water after sustained pumping, you can conclude that the point well screen is still fully below the water table. The pumped water

should be discharged down hill and substantially away from the well point to prevent "double counting" of the available water.

The intent of the pump test is to develop an equilibrium between the amount of water being pumped out of the point well and the amount which is replenished naturally from the ground. The discharge should be piped at least 200 feet from the well, and downhill, to prevent recycling or "double counting" of the available water. When first beginning, do not run this dirty water through your plumbing if it can be prevented.

If the drawdown in the well is at a relative maximum depth and has stabilized, this can be considered as the maximum safe yield of the well for that season of the year. This test should be run, in the late summer or early fall when the groundwater table is at its lowest. Otherwise, it must be recognized that a lower water table, still above the screen, will further reduce the well's yield.

Disinfection - Chlorination

For new point wells or where well pumps have been recently repaired or replaced, it is most important to flush the well clean of silt (mud) before chlorinating or testing for bacteria. The well may have to be continuously pumped for days (or weeks, in a few new well cases) before this cleaning process is complete. Chlorine, regardless of its concentration is NOT able to reach bacteria trapped inside accumulations of mud. We strongly advise that a bacterial test NOT be taken until the well has been thoroughly flushed.

To disinfect a point well set aside 10-30 gallons of clean water in a clean trash can. Take off the point well cap; add 1-2 quarts of hypochlorite. Then pour the clean water into the 2.5" +- well casing so as to disperse the chlorine down to the well screen. One gallon of 5.25 percent sodium hypochlorite (common store bleach) in 1,000 gallons of water will provide a good disinfecting solution of 50 parts per million (ppm). Run each faucet in your home until a chlorine smell is detectable. Close the faucets and allow the chlorine to stay in the well and the plumbing 12-24 hours.

Testing New Wells for Water Quality

After ALL the chlorine is flushed from the well and plumbing system, a sample can be taken for bacterial and chemical testing. Remember all chlorine must be flushed from the well. The presence of chlorine in water sample containers means that the sample can NOT be tested for bacteria or nitrate/nitrite. The presence of chlorine can be checked by using a chlorine test kit. These kits are available from swimming pool supply stores or neighbors with pools.

For persons desiring to use the DES laboratory, there is a $10 fee for a bacterial test and a $75 fee for "standard analysis." Only agency sampling containers can be used. The time to process the standard samples is approximately three weeks in the summer and two weeks otherwise. Different containers are required for sampling radon gas, industrial solvents and hydrogen sulfide odor.

Sampling containers can be obtained from the Laboratory Services Unit. See DES fact sheet **WD-WSEB-2-1** for a discussion of which water quality factors to test in private well. We recommend that a bacterial sample be taken on an annual basis for point wells in view of their shallow construction and once every 5 years for chemistry.

INSPECTING EXISTING POINT WELLS

When inspecting an existing point well, look for any defects or openings in the well casing which will allow foreign substances or small animals to enter the well casing. Look for uneven settling around the well point. Typically point wells have very reliable bacterial quality. Any opening in the casing will break the vacuum, generally preventing pumping and thus immediately giving notice of the problem.

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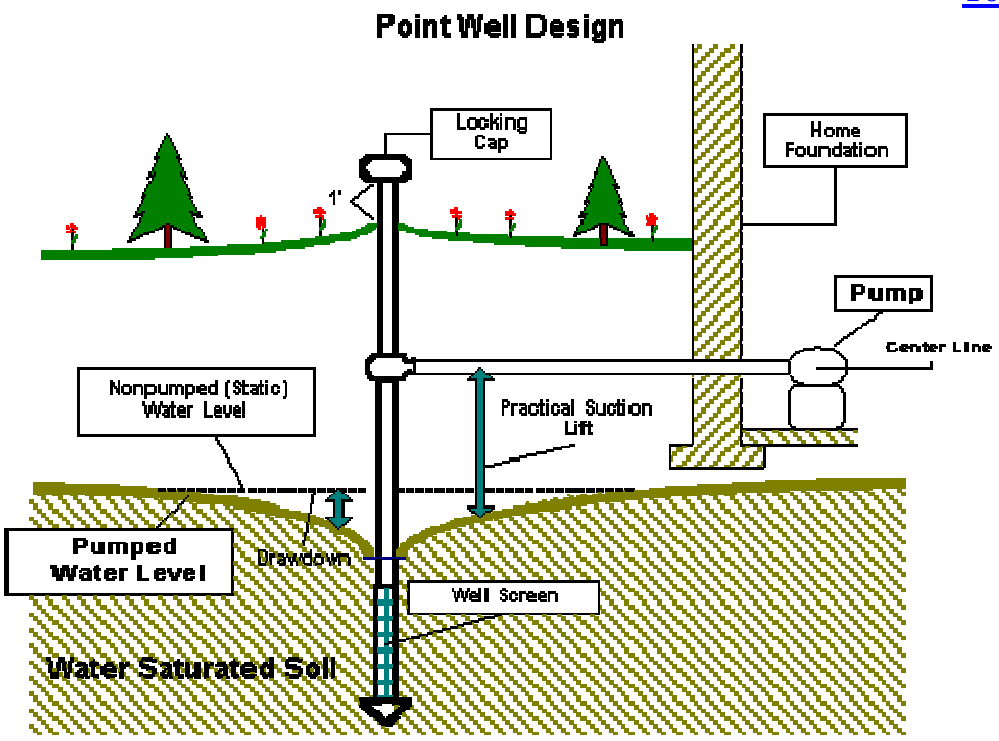

FOR MORE INFORMATION

For more information, please call the appropriate party listed below. For a complete list of fact sheets please request fact sheet **WD-WSEB-15-2**. We would appreciate your comments and suggestions pertaining this fact sheet. Drinking water fact sheets are available through the DES web site at: **http://www.des.nh.gov/** then select: publications, fact sheets, water division, water supply.

Licensing Water Well Contractors, Well Construction Code **271-3139**
Water Well Board
29 Hazen Drive
Concord, NH 03301

Water Quality Testing & Sample Containers **271-3445**
DES Laboratory Unit **271-3446**
PO Box 95, 29 Hazen Dr.
Concord, NH 03302-0095

Water Quality Analysis, Discussions of Treatment Options **271-3139**
Water Supply Engineering Bureau
PO Box 95, 29 Hazen Dr.
Concord, NH 03302-0095